

DROSOPHILA HEDGEHOG
CHICKEN HEDGEHOG-A
CHICKEN HEDGEHOG-B

R	C	K	E	K	L	N	V	L	A	Y	S	V	M	N	E	W	P	G	I	R	L	L	V	T
R	C	K	E	R	V	N	S	L	A	I	A	V	M	H	M	W	P	G	V	R	L	R	V	T
R	C	K	D	K	L	N	A	L	A	I	S	V	M	N	Q	W	P	G	V	K	L	R	V	T

DROSOPHILA HEDGEHOG
CHICKEN HEDGEHOG-A
CHICKEN HEDGEHOG-B

E	S	W	D	E	D	Y	H	H	G	Q	E	S	L	H	Y	E	G	R	A	V	T	I	A	T
E	G	W	D	E	D	G	H	H	L	P	D	S	L	H	Y	E	G	R	A	L	D	I	T	T
E	G	W	D	E	D	G	H	H	S	E	E	S	L	H	Y	E	G	R	A	V	D	I	T	T

DROSOPHILA HEDGEHOG
CHICKEN HEDGEHOG-A
CHICKEN HEDGEHOG-B

S	D	R	D	Q	S	K	Y	G	M	L	A	R	L	A	V	E	A	G	F	D	W	V
S	D	R	D	R	H	K	Y	G	M	L	A	R	L	A	V	E	A	G	F	D	W	V
S	D	R	D	R	S	K	Y	G	M	L	A	R	L	A	V	E	A	G	F	D	W	V

FIGURE 1

1 - - - - - HVEHL L L T R I L L V G F I C A L L V S CHICKEN SONIC HEDGEHOG
1 H D H H S S V P W A S A A S V T C L S L D A K C H S S S S S S S S K S A A S S I DROSOPHILA HEDGEHOG

1 - - - - - HVEHL L L T R I L L V G F I C A L L V S CHICKEN SONIC HEDGEHOG
41 S A I P Q E E T Q T H R H I A H T Q R C L S R L T S L V A L L L I V L P H V F S DROSOPHILA HEDGEHOG

23 S G L T C G P G R G I G K R R H P K K L T P L A Y K Q F I P N V A E K T L G A S CHICKEN SONIC HEDGEHOG
81 P A H S C G P G R G L G R H R - A R H L Y P L V L K O T I P N L S E Y T H S A S DROSOPHILA HEDGEHOG

63 G R Y E G K I T R N S E R F K E L T P H Y N P D I I F K D E E N T G A D R L H T CHICKEN SONIC HEDGEHOG
120 G P L E G V I R N D S P K F K D L V P H Y N R D I L F R D E P G T G A D R L H S DROSOPHILA HEDGEHOG

103 Q R C K D K L H A L A I S V H N Q H P C V K L R V T E C H D E D C H H S E E S L CHICKEN SONIC HEDGEHOG
160 K L C K E K L N V L A Y S V H N Z H P C I R L L V T E S W D E D Y H H G Q E S L DROSOPHILA HEDGEHOG

143 H Y E G R A V D I T T S D R D R S K Y O H L A R L A V E A Q P D H V Y Y E S K A CHICKEN SONIC HEDGEHOG
200 H Y E G R A V T I A T S D R D Q S K Y G H L A R L A V E A G P D H V S Y V S R R DROSOPHILA HEDGEHOG

183 H I H C S V K A E H S V A A K S G G C F P O S A T V H L E H Q O T K L V K D L S CHICKEN SONIC HEDGEHOG
240 H L Y C S V K S D S S I S S H V H Q C F T P E S T A L L E S G V R K P L O E L S DROSOPHILA HEDGEHOG

223 P G D R V I A A D A D G R L L Y S D F L T F L D R H D S S R K L F Y V I E T R Q CHICKEN SONIC HEDGEHOG
280 I G D R V L S H T A N G Q A V Y S E V I L E H D R N L E Q H Q N F V Q L H T - D DROSOPHILA HEDGEHOG

263 P H A R I L I T A A H I L L F V A P Q H H O S E A T O S T S Q Q A L F A S H V K P CHICKEN SONIC HEDGEHOG
319 Q C A V L T V T F A H L L V S V H Q - - - - - P E S Q K L T F V F A D R I E E DROSOPHILA HEDGEHOG

303 G Q H V Y V L G E C G Q Q L L P A S V H S V S L R E E A S G A Y A P L T A O G T CHICKEN SONIC HEDGEHOG
352 K H O V L V R D V E T G E L R P Q R V V K V G - S V R S K G V V A P L T R E G T DROSOPHILA HEDGEHOG

343 I I I H R V L A S C Y A V I E E H S H A H H A F A P F R L A Q C L - - - L A A - CHICKEN SONIC HEDGEHOG
391 I V V H S V A A S C Y A V I N S Q S L A H H O L A P H R L L S T L E A W L P A K DROSOPHILA HEDGEHOG

379 - - L C P D C A I P T A A T T T T G I H H Y S R L L Y R I G S H V L D O D A L H CHICKEN SONIC HEDGEHOG
431 E Q L H S S P K V V S S A Q Q Q N Q I H H Y A N A L Y K V K D Y V L P Q S H R H DROSOPHILA HEDGEHOG

417 P L G H V A P A S CHICKEN SONIC HEDGEHOG
471 D DROSOPHILA HEDGEHOG

FIGURE 2

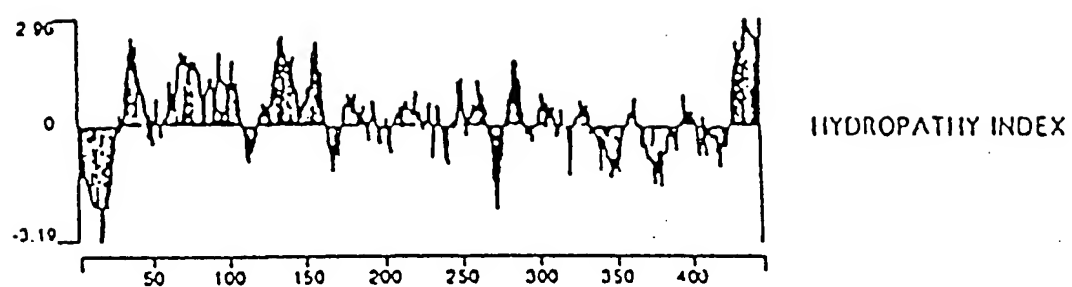


FIGURE 3

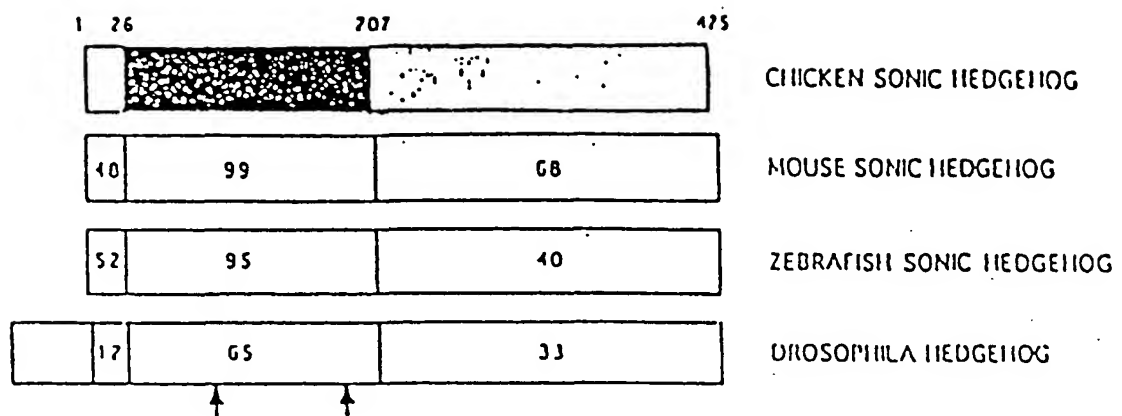


FIGURE 4

U-hh	MDNHSSVPWA	SAASVTCLSL	DAKCHSSSSS	SSSKSAASSI	SAIPQEETQT
M-Dhh	.....	.....	.....	.....	.....
M-Ihh	.....	.....	.....	.....	.....
M-Shh	.....	.....	.....	.....	.....
C-Shh	.....	.....	.....	.....	.....
Z-Shh	.....	.....	.....	.....	.....
51					
D-hh	MRHIAHTQRC	LSRLTSLVAL	LLIVLPMVFS	PAHSCGPGRG	LGRHR...AR
M-Dhh	.....	..MALPASLL	PLCCLALLAL	SAQSCGPGRG	PVGRRRYVRK
M-Ihh	.....	.....	.....	.....	.....
M-Shh	.....	MLLLLARCFL	VILASSLLVC	PGLACGPGRG	FGKRRH...PK
C-Shh	.....MV	EMLLLTRILL	VGFIGALLVS	SGLTCGPGRG	IGKRRH...PK
Z-Shh	.....	..MRLLTRVLL	VSLTSLSLVV	SGLACGPGRG	YGRRRH...PK
101					
D-hh	NLYPLVLKQT	IPNLSEYTN	ASGPLEGVIR	RDSPKPKDLV	PNTNRDILFR
M-Dhh	QLVPLLYKQF	VPSMPERTLG	ASGPAEGRVT	RGSEFRDLV	PNTNPDIIFF
M-Ihh	.....	.....	.....	...ERFKELT	PNTNPDIIFF
M-Shh	KLTPLAYKQF	IPNVAEKTG	ASGRYEGKIT	RNSERPKELT	PNTNPDIIFF
C-Shh	KLTPLAYKQF	IPNVAEKTG	ASGRYEGKIT	RNSERPKELT	PNTNPDIIFF
Z-Shh	KLTPLAYKQF	IPNVAEKTG	ASGRYEGKIT	RNSERPKELT	PNTNPDIIFF
151					
D-hh	DEEGTGADRL	MSKRCCKELN	VLAYSVMNEW	PGIRLLVTES	WDEDYHGGQE
M-Dhh	DEENSGADRL	MTQRCKERN	ALAIAMNMW	PGVRLRVTEG	WDEDGHHQD
M-Ihh	DEZNTGADRL	MTQRCKDRLN	SLAISVMNQW	PGVKLRTVEG	RDEDGHHSEE
M-Shh	DEZNTGADRL	MTQRCKDKLN	ALAISVMNQW	PGVRLRVTEG	WDEDGHHSEE
C-Shh	DEZNTGADRL	MTQRCKDKLN	ALAISVMNQW	PGVKLRTVEG	WDEDGHHSEE
Z-Shh	DEZNTGADRL	MTQRCKDKLN	SLAISVMNMW	PGVKLRTVEG	WDEDGHHFEE
201					
D-hh	SLHYEGRAVD	IATSDRDQSK	YGLARLAVE	AGFDWVSYS	RRHIYCSVKS
M-Dhh	SLHYEGRALD	ITTSDRDRNK	YGLLARLAVE	AGFDWVYYES	RNHIHVSVA
M-Ihh	SLHYEGRAVD	ITTSDRDRNK	YGLLARLAVE	AGFDWVYYES	KAHVHCSVKS
M-Shh	SLHYEGRAVD	ITTSDRDRSK	YGLARLAVE	AGFDWVYYES	KAHIHCSVKA
C-Shh	SLHYEGRAVD	ITTSDRDRSK	YGLARLAVE	AGFDWVYYES	KAHIHCSVKA
Z-Shh	SLHYEGRAVD	ITTSDRDRSK	YGLSRLAVE	AGFDWVYYES	KAHIHCSVKA
251					
D-hh	DSSISSHVHG	CFTPESTALL	ESGVRKPLGE	LSIGDRVLSM	TANGQAVYSE
M-Dhh	DNSLAVRAGG	CFPGNATVRL	RSGERKGLRE	LHRGDWVLA	DAAGRVVPTP
M-Ihh	EKSAAKTGG	CFPAGAQRVL	ENGVALSA	VKPGDRVLAM	GEDGTPTFSD
M-Shh	ENSVAAKSGG	CFPGSATVHL	EQGGTKLVKD	LSPGDRVLAA	DDQGRLLYSD
C-Shh	ENSVAAKSGG	CFPGSATVHL	EHGGTKLVKD	LSPGDRVLAA	DADGRLLYSD
Z-Shh	ENSVAAKSGG	CFPGSALVSL	QDGGQKAVKD	LNPGDKVLAA	DSAGNLVFS
301					
D-hh	VILFMDRNL	QMONTVOLHT	..DGGAVLTVT	PAHLVSVWQ.	.....PESQ
M-Dhh	VLLFLDRDLQ	RRASFVAVET	ERPPRKLTLT	PWHLVFAAR.	.....GPAPAPG
M-Ihh	VLIFLDREPN	RLRAFQVIET	QDPPRLRLT	PAHLFIADN	HTE.....PAA
M-Shh	FLTFLDREDEG	AKKVIFYVIET	LEPRERLLLT	AAHLFVAP.	HNDSGPTPGP
C-Shh	FLTFLDREDEG	SRKLFYVIET	RQPRARLLLT	AAHLFVAPQ	HNQSEATGST
Z-Shh	FIMPTDRDST	TRRVIFYVIET	QEPVEKITLT	AAHLFVLDN	STEDLHTMT.
351					
D-hh	KLTFVFADRI	EEKNOVLV..	RDVETGELRP	QRVVKVG.SV	RSKGVVAPLT
M-Dhh	DFAPVFARRL	RAGDSVLA..	..PGGDALQP	ARVARVA.RE	EAVGVFAPLT
M-Ihh	HFRATFASHV	QPGQYVLV..	..SGVPCLQP	ARVAAYS.TH	VALGSYAPLT
M-Shh	S..ALFASRV	RPGQRVYVVA	ERGDDRLLP	AAVHSVLTRE	EEACAYAPLT
C-Shh	SGQALFASNV	KPGQRVYVVG	E..CGQQLLP	ASVHSVSLRE	EASGAYAPLT
Z-Shh	...AAYASSV	RAGQKVMVVD	DSGQLKSVIV	QRIYT....E	EQRGSFAPVT
401					
D-hh	REGTIVVNSV	AASCYAVINS	QSLAHWGLAP	MRLSTLEAW	LPAKEQLHSS
M-Dhh	AHGTLLVNDV	LASCYAVLES	HQWAHRAFAP	LRLHALGAL	LP.....
M-Ihh	RHGTLLVEDV	VASCFAAVAD	HHLAQLAFWP	LRLFPSL...	.....
M-Shh	AHGTILINRV	LASCYAVIEE	HSWAHRAFAP	FRLAHALLAA	LAPARTDGGG
C-Shh	AQGTILINRV	LASCYAVIEE	HSWAHRAFAP	FRLAQGLLAA	LCP.....
Z-Shh	AHGTIVVDRI	LASCYAVIED	QGLAHAFAP	ARLYYVSSF	LSP.....
451					
D-hh	PKVV.....	...SSAQOQN	GIHWYANALY	KVKDYVLPQS	WRHD*
M-Dhh	.....	...GGAVQPT	GMHWYSRLLY	RLAEELMG*	.....
M-Ihh	.....	...AWGSWTPSE	GVHSYPOMLY	RLGRLLLES	TFHPLGMSGA
M-Shh	GGSIAPAAQSA	TEARGAEPTE	GIHWYSQLLY	HIGTWLLDSE	RMHPLGMAVK
C-Shh	DGAIPTA...	...ATTIT	GIHWYSRLLY	RIGSWLDGD	ALHPLGMVAP
Z-Shh	KTPAVGPMRL	YNRRGSTGTP	GSC.....H	QMGTWLLDSN	MLHPLGMSVN
501					
M-Ihh	GS*				
M-Shh	SS*				
C-Shh	AS*				
Z-Shh	SS*				

FIGURE 5A

Figure 5B

M-Dhh:	C	G	P	G	R	G	F	V	G	R	R	R	H	*	* P	K	L	T	P	L	A	Y	K	Q	F	I	P	N	V	A	E	K	T	L	G	A	S	G	R	Y	E	G	K	I	S	R	N	S	E	R	F	K	E	L	T		
M-Ihh:	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
H-Ihh:	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
H-Shh:	C	G	P	G	R	G	F	G	K	R	R	H	*	*	*	P	K	K	L	T	P	L	A	Y	K	Q	F	I	P	N	V	A	E	K	T	L	G	A	S	G	R	Y	E	G	K	I	S	R	N	S	E	R	F	K	E	L	T
C-Shh:	C	G	P	G	R	G	I	G	K	R	R	H	*	*	*	P	K	K	L	T	P	L	A	Y	K	Q	F	I	P	N	V	A	E	K	T	L	G	A	S	G	R	Y	E	G	K	I	T	R	N	S	E	R	F	K	E	L	T
M-Shh:	C	G	P	G	R	G	F	G	K	R	R	H	*	*	*	P	K	K	L	T	P	L	A	Y	K	Q	F	I	P	N	V	A	E	K	T	L	G	A	S	G	R	Y	E	G	K	I	T	R	N	S	E	R	F	K	E	L	T
Z-Shh:	C	G	P	G	R	G	Y	G	R	R	R	H	*	*	*	P	K	K	L	T	P	L	A	Y	K	Q	F	I	P	N	V	A	E	K	T	L	G	A	S	G	R	Y	E	G	K	I	T	R	N	S	E	R	F	K	E	L	T
CON:	C	G	P	G	R	G	X	X	X	R	R	X	X	X	X	P	K	X	L	X	P	L	X	Y	K	Q	F	X	P	X	X	E	X	T	L	G	A	S	G	X	X	E	G	X	X	R	X	S	E	R	F	X	X	L	T		

P N Y N P D I I F K D E E N S G A D R L M T E R C K E R V N A L A I A V M N W P G V R L R V T E G W D E D G H
P N Y N P D I I F K D E E N T G A D R L M T Q R C K D R L N S L A I S V M N Q W P G V K L R V T E G R D E D G H
*
P N Y N P D I I F K D E E N T G A D R L M T Q R C K D K L N A L A I S V M N Q W P G V K L R V T E G W D E D G H
P N Y N P D I I F K D E E N T G A D R L M T Q R C K D K L N A L A I S V M N Q W P G V K L R V T E G W D E D G H
P N Y N P D I I F K D E E N T G A D R L M T Q R C K D K L N A L A I S V M N Q W P G V K L R V T E G W D E D G H
P N Y N P D I I F K D E E N T G A D R L M T Q R C K D K L N S L A I S V M N H W P G V K L R V T E G W D E D G H
P N Y N P D I I F K D E E N X G A D R L M T X R C K X

H A Q D S L H Y E G R A L D I T S D R D R N K Y G L L A R L A V E A G F D W V Y E S R N H I H V S V K A D
H S E E S L H Y E G R A V D I T T S D R D R N K Y G L L A R L A V E A G F D W V Y E S K A H V H C S V K S E E
H S E E S L H Y E G R A V D I T T S D R D R N K Y G L L A R L A V E A G F D W V Y E S K A H V H C S V K S E E
H S E E S L H Y E G R A V D I T T S D R D R S K Y G M L A R L A V E A G F D W V Y E S K A H I H C S V K A E E
H S E E S L H Y E G R A V D I T T S D R D R S K Y G M L A R L A V E A G F D W V Y E S K A H I H C S V K A E E
H S E E S L H Y E G R A V D I T T S D R D R S K Y G M L A R L A V E A G F D W V Y E S K A H I H C S V K A E E
H F E E S L H Y E G R A V D I T T S D R D K S K Y G T L S R R L A V E A G F D W V Y E S K A H I H C S V K A E E
H X X X S L H Y E G R A X D I T T S D R D X X K Y G X L X R R L A V E A G F D W V Y E S X X H X H X S V K X X

	M-Dhh	M-Ihh	C-Shh	Zf-Shh	D-hh
M-Shh	61 (77)	63 (78)	84 (92)	68 (80)	48 (64)
M-Dhh		58 (75)	61 (77)	54 (71)	51 (68)
M-Ihh			64 (78)	61 (75)	48 (68)
C-Shh				68 (80)	49 (64)
Zf-Shh					47 (64)

FIGURE 6

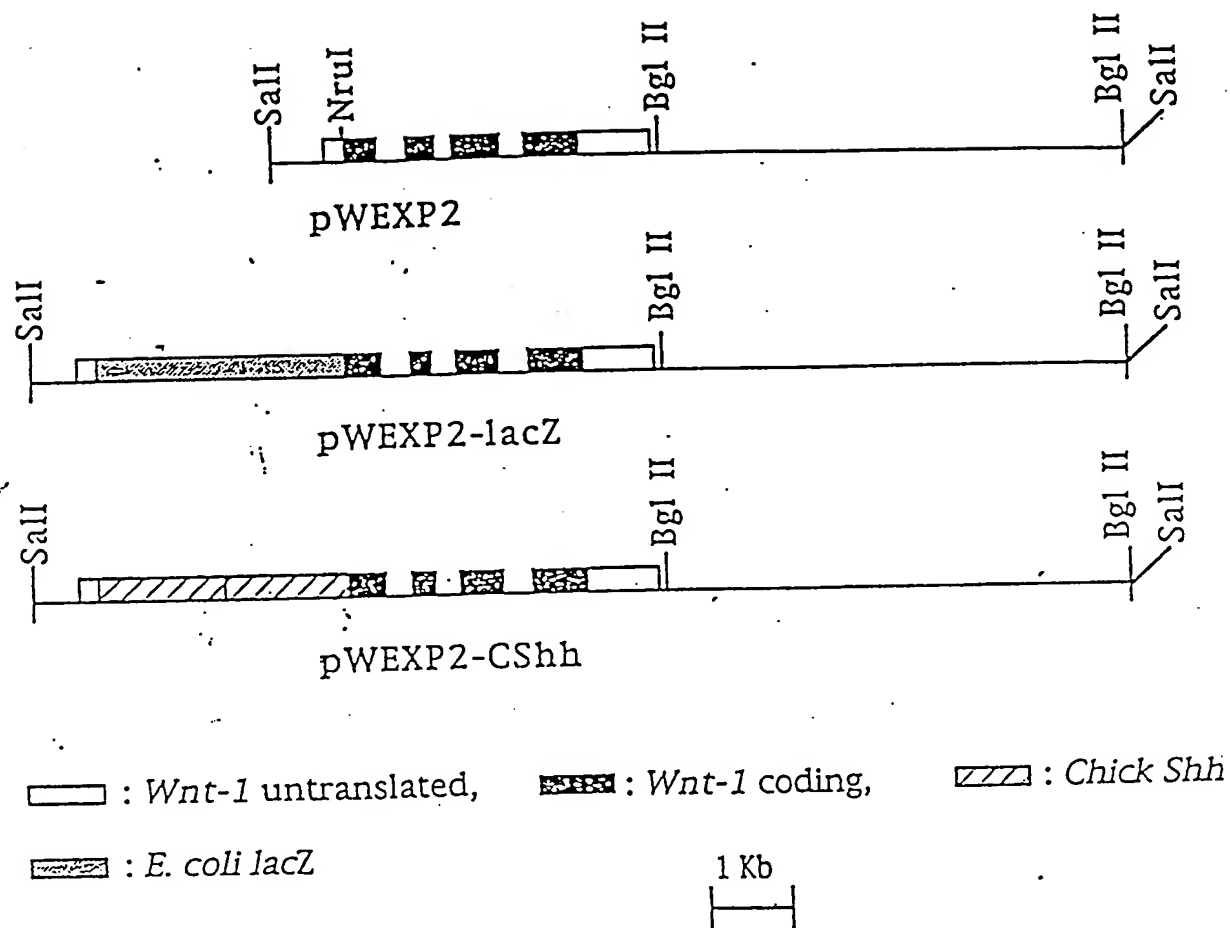


FIGURE 7

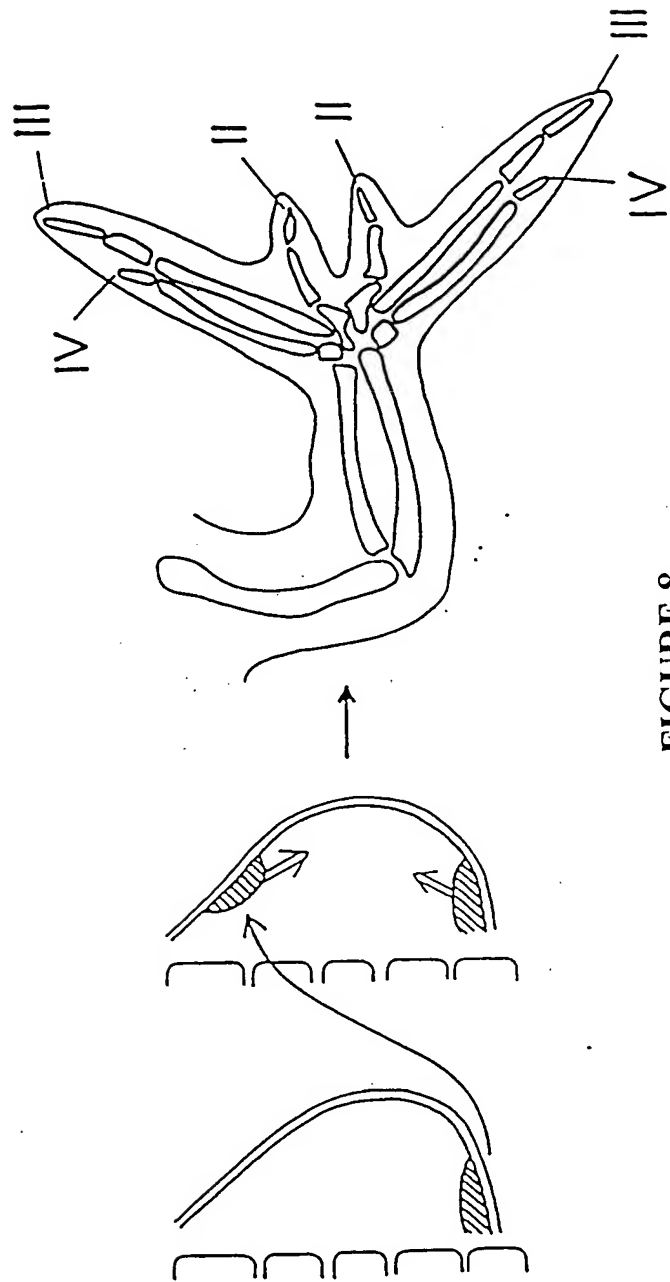
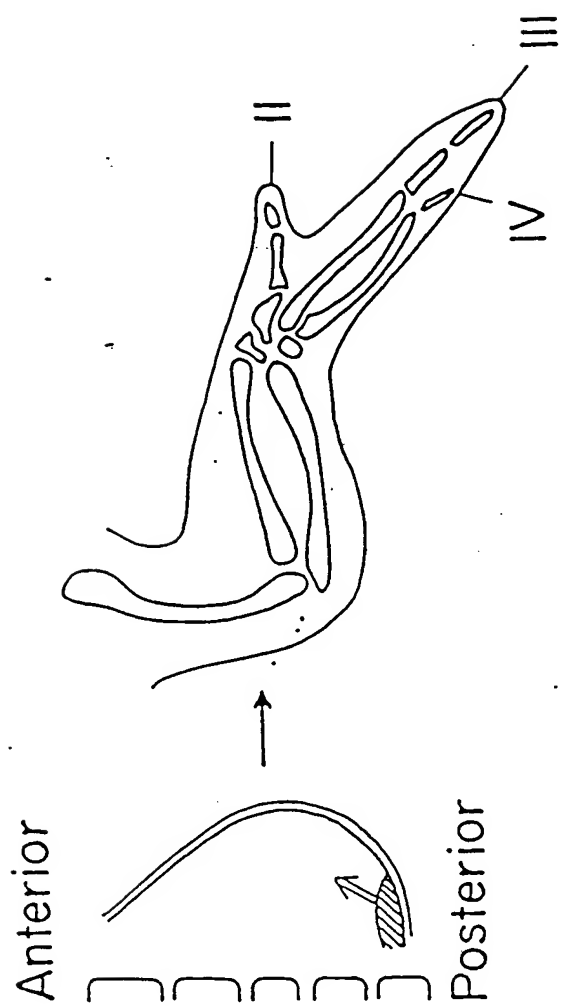


FIGURE 8

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hh 1 MDNHSSVPWASAASVTCLSLDAKCHSSSSSSSSSKSAASSISAIPQEETQT
shh .....

hh 51 MRHIAHTQRCLSRLTSLVALLLIVLPMVFSPAHS CGPGRGLGRHR. ARNL
      || | | | | ||||| || |
shh 1 .....MRLLTRVLLVSLTSLVVS. GLACGPGRGYGRRRHHPKKL

hh 100 YPLVLKQTIPNLSEYTNSASGPLEGVIRRDSPKFKDLVPNYNRDILFRDE
      || ||||| || ||||| || ||||| || ||||| || |||||
shh 40 TPLAYKQFIPNVAEKT LGASGRYEGKITRNSERFKELTPNYNPDIIFKDE

hh 150 EGTGADRLMSKRCKEKLNVLAISMNEWPGIRLVVTESWDEYHHGQESL
      | ||||| || ||||| || ||||| || ||||| || ||||| || |||||
shh 90 ENTGADRLMTQRCKDKLNSLAISMNHWPVGKLRVTEGWDEDDGHHFEESL

hh 200 HYEGRAVTIATSDRDQSKYGMLARLAVEAGFDWVSYSRRHIYCSVKSDS
      ||||| || ||||| || ||||| || ||||| || ||||| || |||||
shh 140 HYEGRAVDITTSDRDQSKYGTLSRLAVEAGFDWVYESKAHHC SVKAEN

hh 250 SISSHVHGCF TPETALLES GVRKPLGELSIGDRVLSMTANGQAVYSEVI
      | || | | | | | | | | | | | | | | | | | | | |
shh 190 SVAAKSGGCFPGSALVSLQDGGQKAVKDLNPGDKVLAADSAGNLVFSDFI

hh 300 LFMDRNLEQM QNFVQLHT. DGGAVLTVTPAHLVSVWQPESQKL...TFVF
      | || | | | | | | | | | | | | | | | | | | |
shh 240 MFTDRDSTTRRVFYVIETQEPVEKITLTAHLLFVLDNSTEDLHTMTAAY

hh 347 ADRIEKNQVLVRDVETGELRPQRVVKVGSVRSKGVVAPLTREGTIVVNS
      | . | | | | | | | | | | | | | | | | | | | |
shh 290 ASSVRAGQKVMVVD. DSGQLKSVIVQRIYTEEQRGSFAPVTAHG TIVVDR

hh 397 VAASCYAVINSQSLAHWGLAPMRLSTLEAWLPAKEQL.....HSS
      ||||| || ||||| || || || || || || || || || || || ||
shh 339 ILASCYAVIEDQGLAHLAFAPARLYYVSSFLSPKTPAVGPMRLYNRRGS

hh 438 PKVVSSAQQQNGIHWYANALYKVKDYVLPQSWRHD 471
      | | | | | | | | | | | | | | | | | | | | |
shh 389 TGTPGSCHQMGTWLLDSNMLHPLGMSV..... 415

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FIGURE 9A

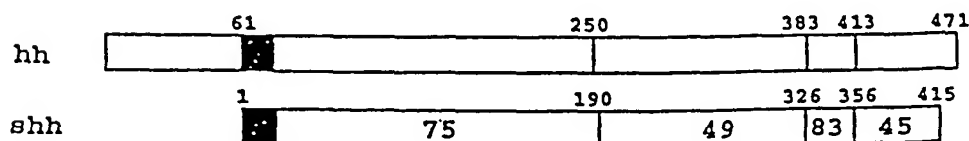


FIGURE 9B

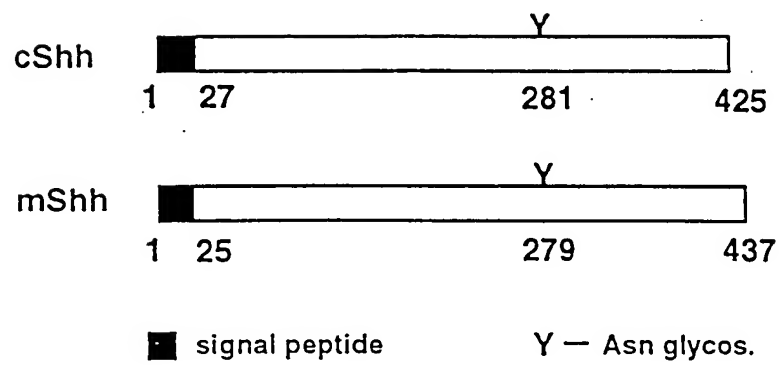


FIGURE 11

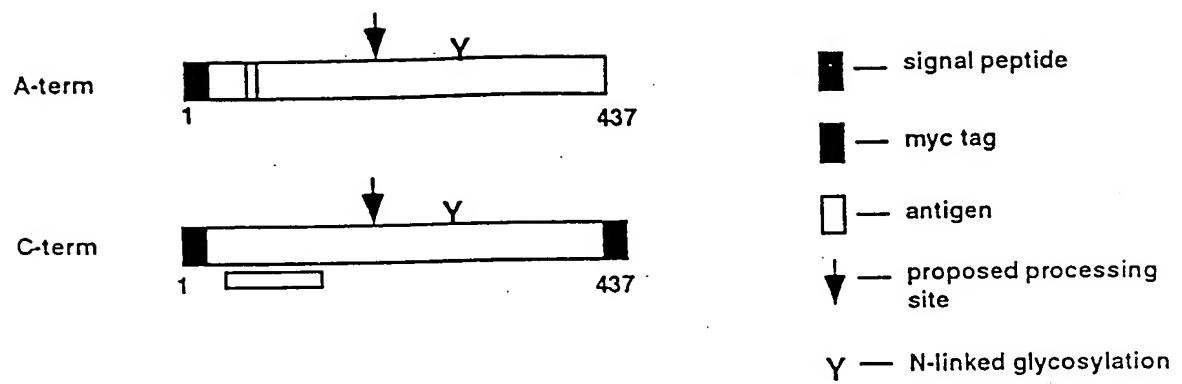


FIGURE 12

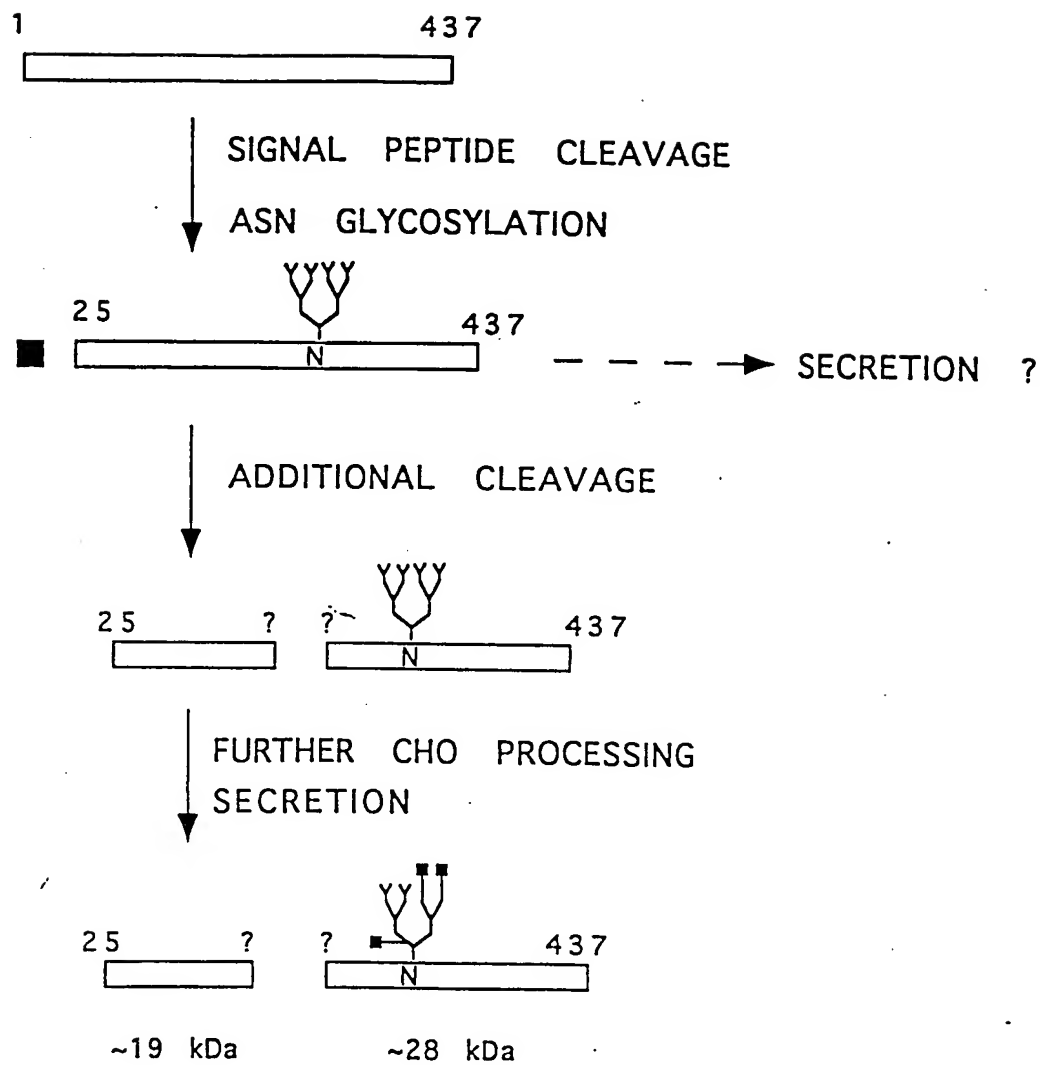


FIGURE 13

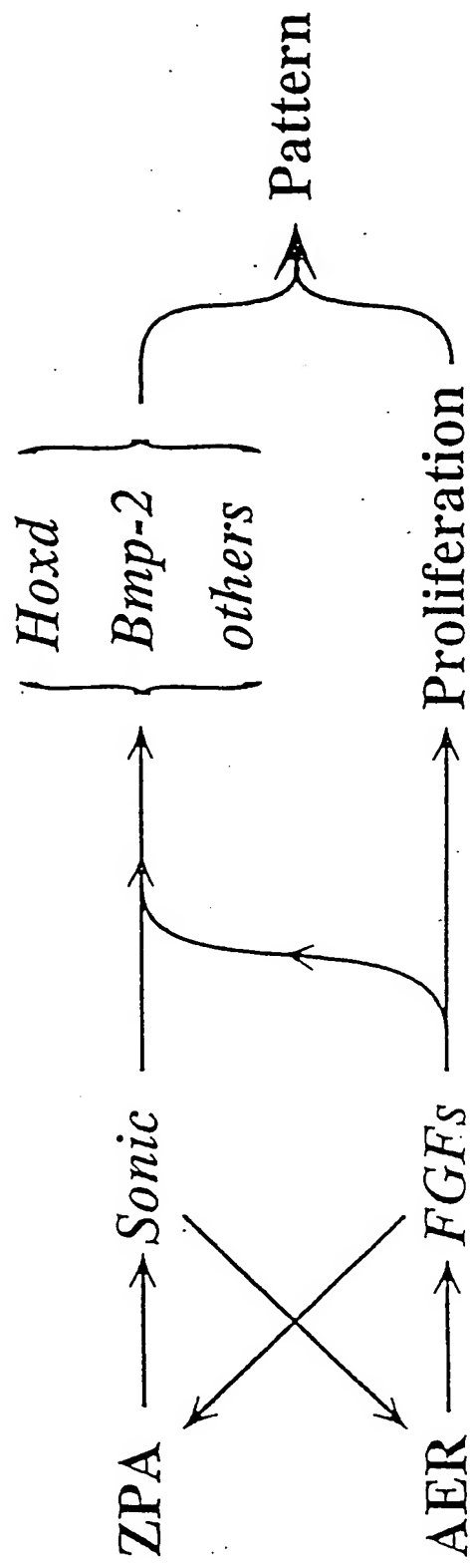


FIGURE 14

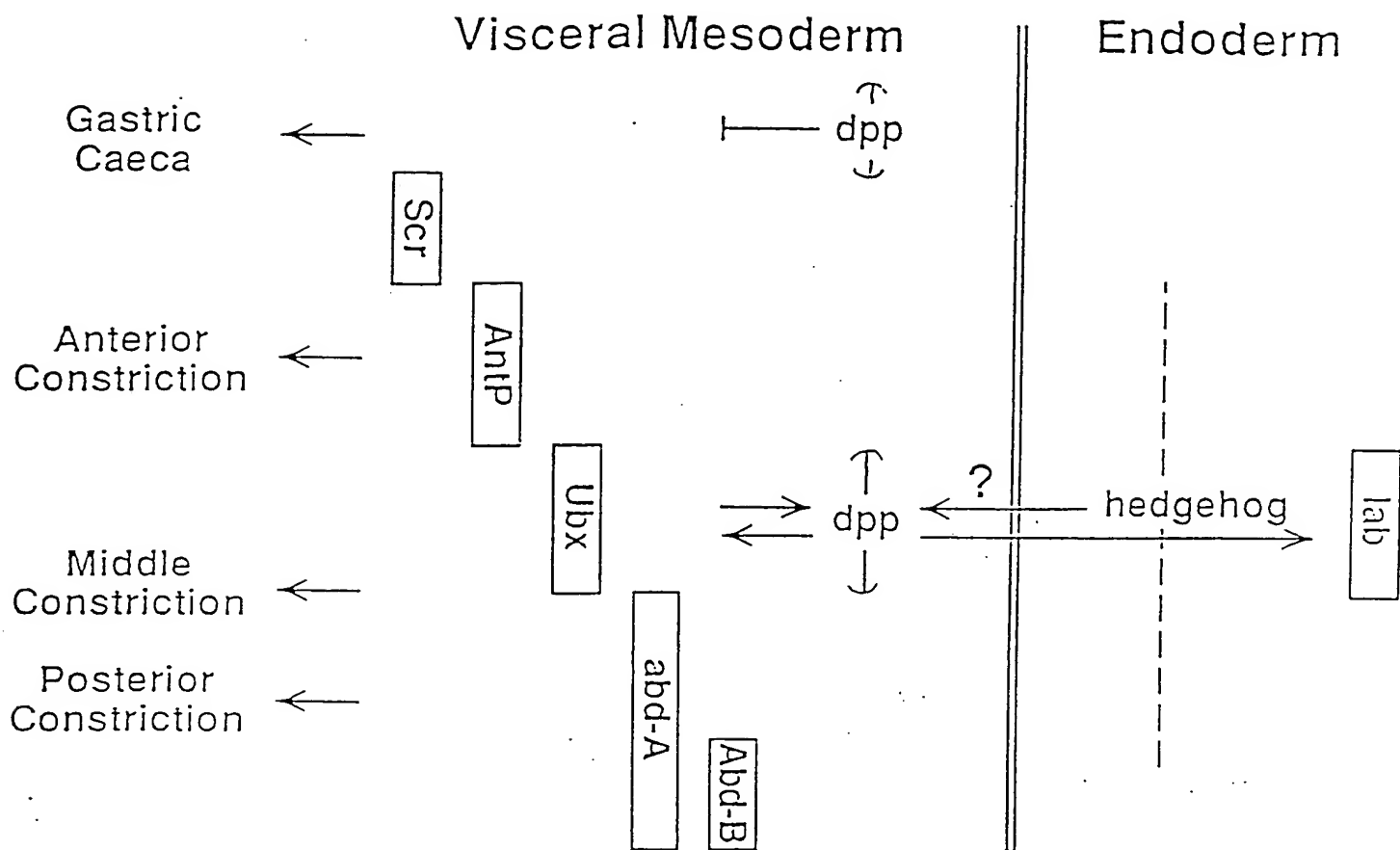


FIGURE 15A

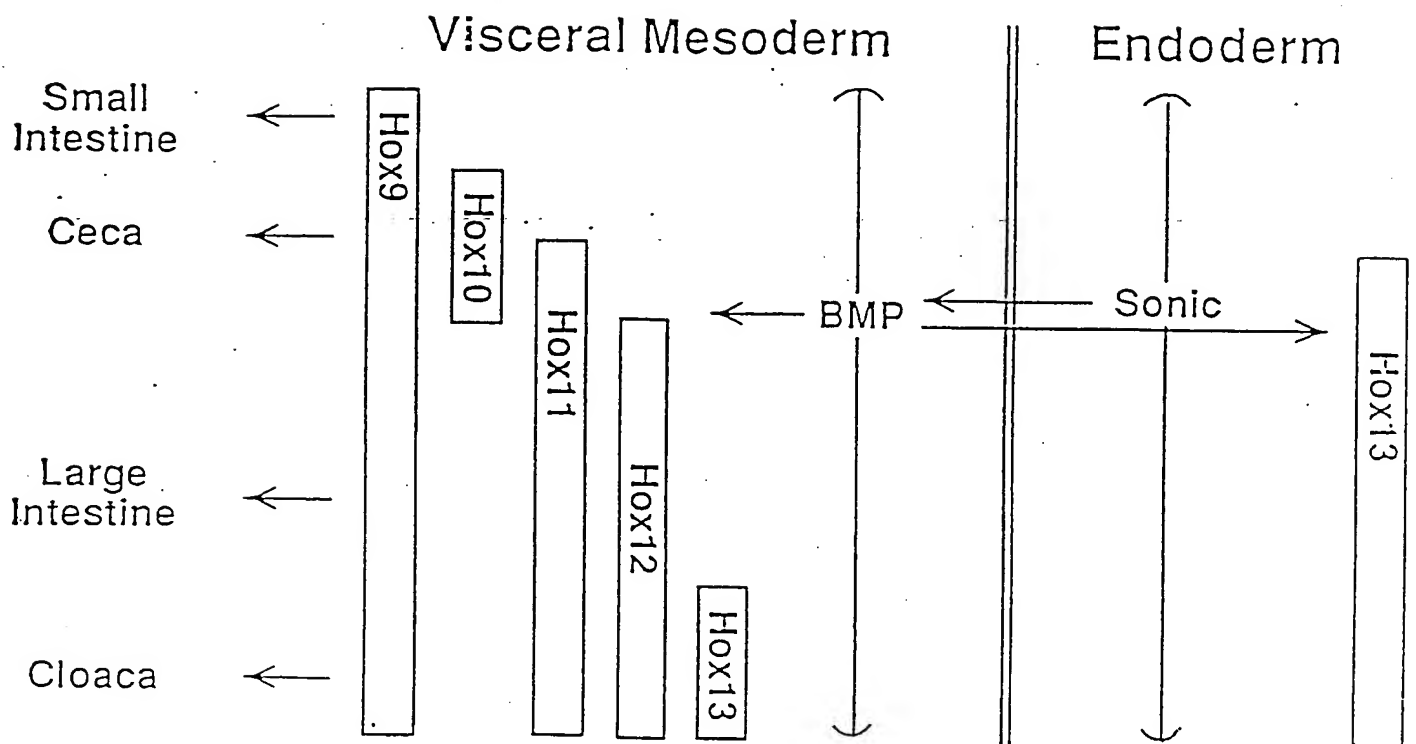


FIGURE 15B

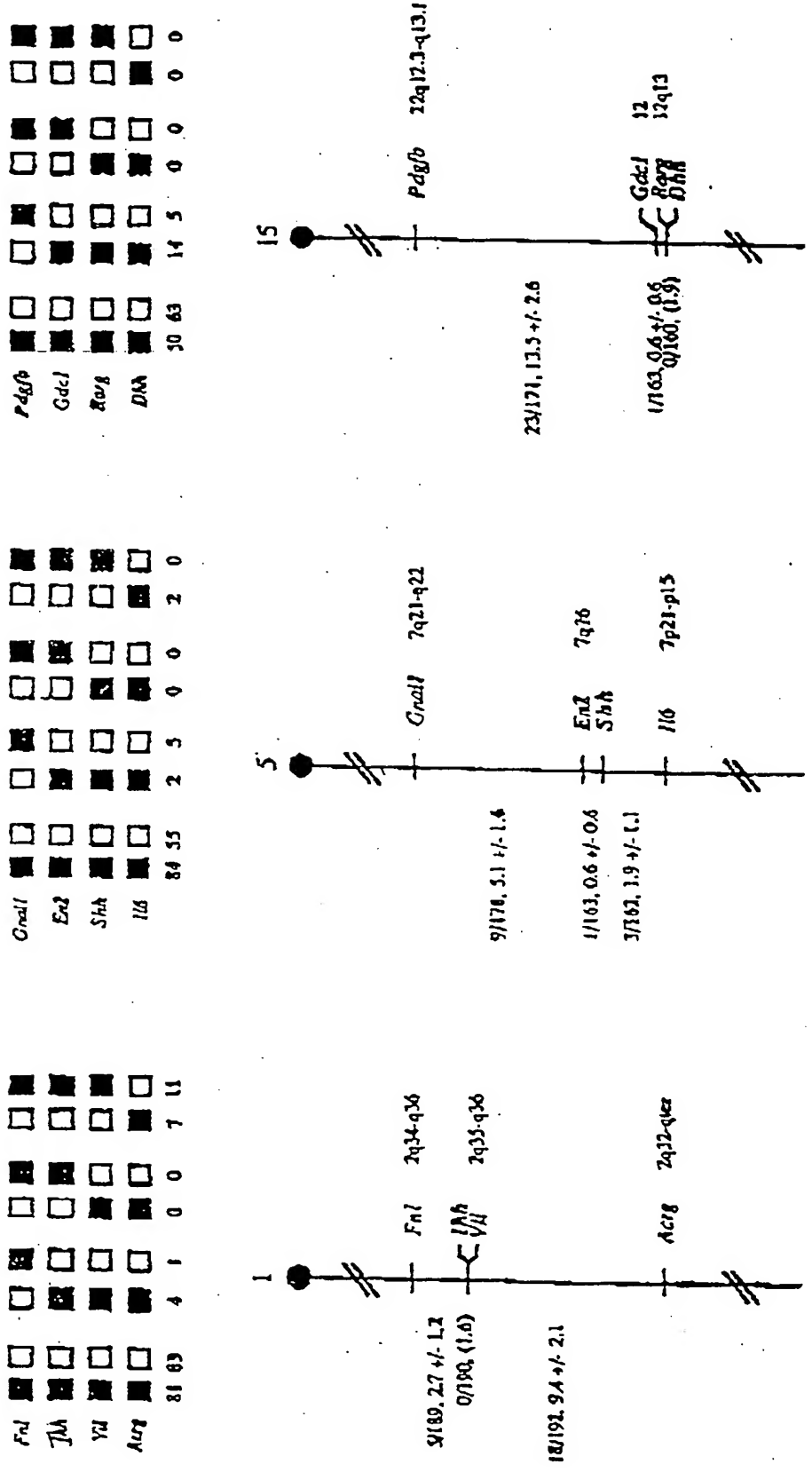


FIGURE 16